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Comparison of PALSAR, Envisat, and COSMO-SkyMed interferograms

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Volcano in Japan is generally vegetated densely, and L-band SAR is useful to apply Interferometric SAR (InSAR) to such area because of its permeability to the vegetation. Actually, many application results of Interferometric SAR (InSAR) by ALOS/PALSAR (L-band SAR) data have shown its effectiveness, and four years PALSAR data accumulation has brought many successful results. Furthermore, the monitoring of crustal deformation by PALSAR/InSAR is also expected recently. However PALSAR has a disadvantage in the time resolution; the repeat observation cycle is long, 46 days. Ozawa and Ueda (2009, 2010) proposed the time-series estimation method which uses interferograms obtained from several observation modes. Its method can also use interferograms obtained from other SAR sensors, and higher time resolution can be obtained if more interferograms are available. For such analysis, high coherence must be also obtained in InSAR analysis using other SAR sensors. Generally, temporal decorrelation easily occurs in InSAR application using higher frequency SAR. However, if observation repeat cycle is short, decorrelation may be small. Then we compare interferograms generated from PALSAR (L-band), Envisat (C-band), and COSMO-SkyMed (X-band) SAR data to see their coherence.
In the interferometric analysis using PALSAR data pair that the observation span was 46 days, quite high coherence was obtained. On the other hand, interferogram generated from Envisat data pair that the observation span was 35 days was heavily decorrelated, suggesting that Envisat/InSAR is not suitable for crustal deformation detection in densely vegetated area such as Miyake-jima. In the interferometric analysis using COSMO-SkyMed data pair that the observation span was 1 day, good coherence which was enough for crustal deformation detection was obtained. Although it may not be suitable for use of the continuous monitoring due to its cost, it may be effective in emergency observations.

Keywords: InSAR, crustal deformation, coherence, PALSAR, COSMO-SkyMed, Envisat